

Feb. 23, 1965

L. J. MARTINIAK
DOMESTIC APPLIANCE

3,170,743

Filed April 18, 1963

2 Sheets-Sheet 1

FIG. 1

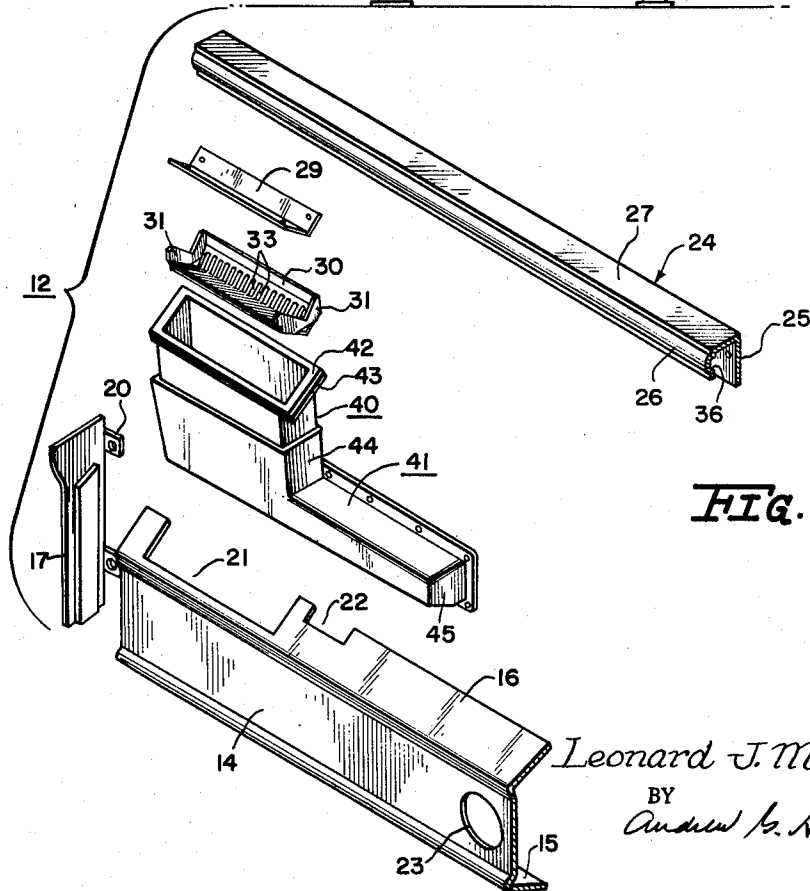
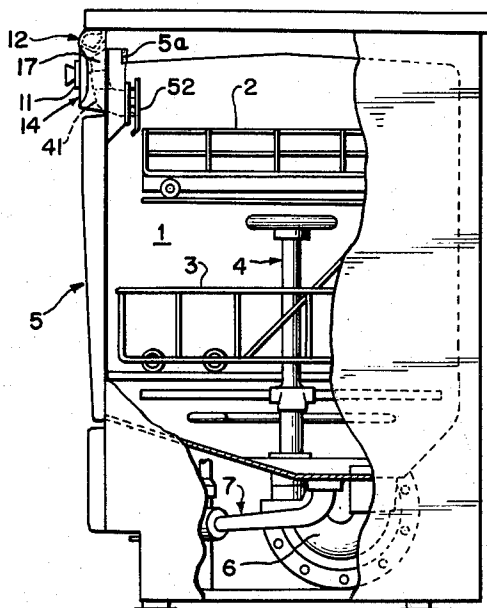


FIG. 5

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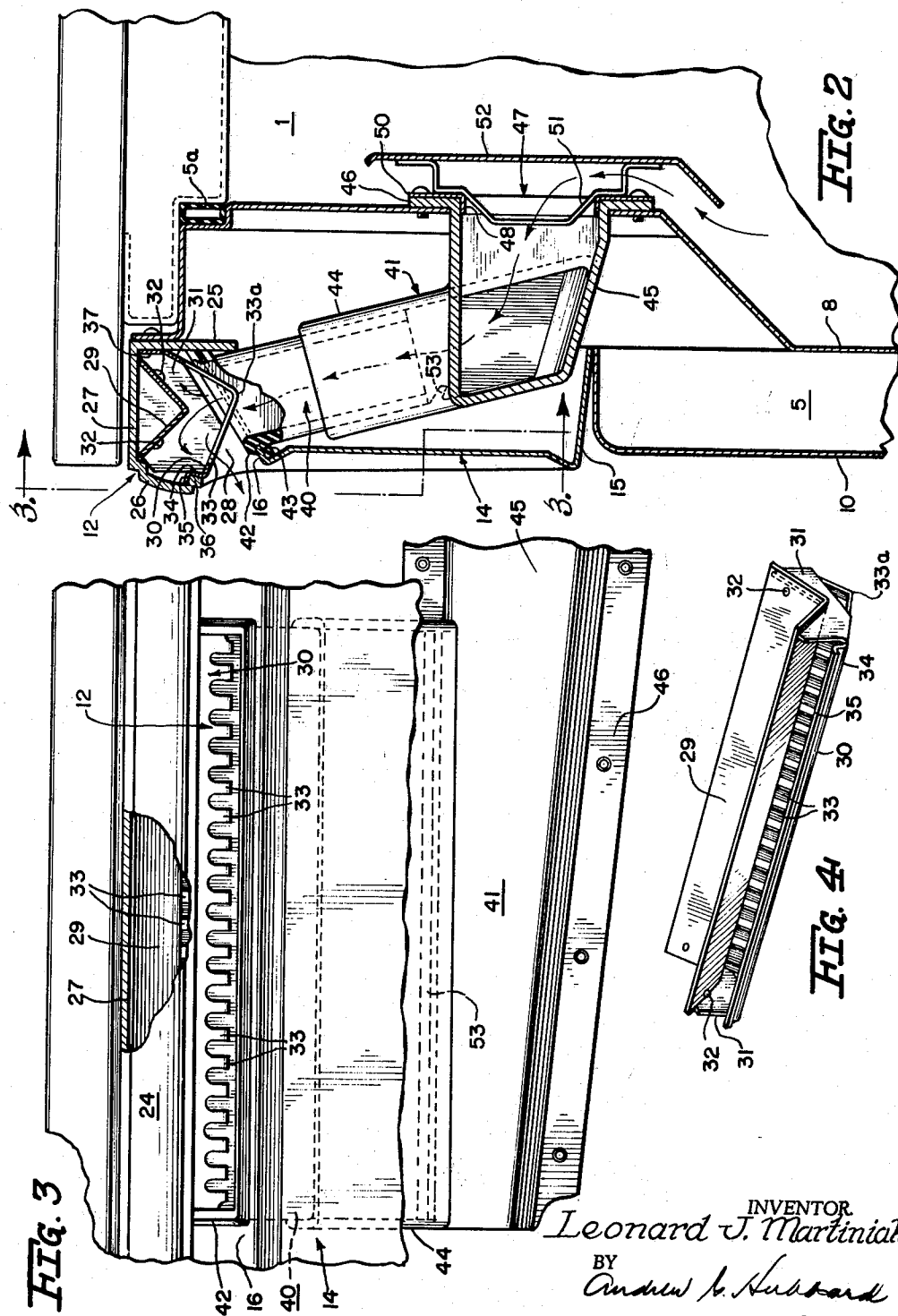
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DOMESTIC APPLIANCE

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Filed Apr. 18, 1963, Ser. No. 273,867
4 Claims. (Cl. 312-213)

This invention relates to dishwashers and, in particular, to a condensing system to condense moisture out of the warm vapors which issue from the dishwasher during the washing and drying operations thereof.

The invention has particular applicability to dishwashers of the domestic type used in residence kitchens. The escape of steamy vapors in such installations can be quite obnoxious during the summer months when the atmospheric humidity is high and during the winter months when ventilation may be inadequate.

It is an object of the invention to provide a condensing system having a condenser disposed in a wall of the dishwasher cabinet—for example, in the closure door for the cabinet—and a conduit communicating between the condenser and the interior of the dishwasher tub.

It is another object of the invention to provide a condensing system particularly adapted for dishwashers of the front opening type in which the closure door is operable between a substantially vertical closed position and a substantially horizontal open position.

It is a further object of the invention to provide a condensing system for a dishwasher having a door hinged to be swung about a horizontal axis, said condensing system having means minimizing the drippage of water from the condenser ducting system in the event the dishwasher door is opened during a washing or rinsing cycle, or immediately after the completion of the final rinsing operation.

In a presently preferred embodiment of the invention as applied to a dishwasher door in which inner and outer panels define a hollow structure, a box-like trim panel having an upper trim strip of inverted channel shape, extends across the upper portion of the outer panel of the door. This trim strip actually constitutes the handle for the door. A condenser system is mounted within the trim panel near one end thereof; the condenser elements per se are housed within the trim strip and are protected thereby. The condenser structure comprises a V-shaped comb-like element within which is nested a second V-shaped condenser element. This second element intercepts the air issuing from the tub, provides a condensing surface on which is condensed at least a part of the moisture content of the air, and diverts the air into contact with the condensing surfaces provided by the comb-like structure. A duct within the door communicates between the interior of the tub and the condenser. The base of the V-shaped condenser portion is within the outlet of the duct, whereupon condensation will drop from the condenser into the duct and return to the tub.

Under some circumstances, as when the dishwasher door is opened during a washing or rinsing operation, or immediately after the final rinsing operation, water drops on the inside of the duct may not have had time to drain back into the tub, and water drops may remain on the condenser. To prevent escape of residual water which may be on the duct walls, I provide, on the inside of the duct, a baffle which intercepts water flow; and a large part of residual condensate on the condenser elements will be caught within the channel shaped trim strip.

In the accompanying drawings, FIG. 1 is a side ele-

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vation of a dishwasher, with the door closed and a side panel of the dishwasher partially broken away;

FIG. 2 is an enlarged sectional view of a portion of the door handle and condenser structure of the dishwasher of FIG. 1 better to show the interfitting relationship therebetween;

FIG. 3 is a fragmentary front elevation of the door and condenser structure, looking in the direction of the arrows 3-3 of FIG. 2 so as particularly to show the drainage boot in front elevation;

FIG. 4 is a perspective view of the assembled condenser structure; and

FIG. 5 is an exploded perspective view of the dishwasher trim panel and associated condenser elements.

Referring to FIG. 1, a dishwasher of the undercounter type includes an open front tub 1 having upper and lower racks 2, 3, a water distribution system 4, and a door 5 which is hinged at its bottom to be swung between the substantially vertical closed position of FIG. 1 and a substantially horizontal open position (not shown). The door is arranged to be latched closed by means of a combination latching and switching device (not shown), it being understood that conventional gasket means 5a is used to seal the closed door against water leakage during dishwasher operation. This basic dishwasher structure is very old in the art and is not to be viewed in any limiting sense as respects the present invention. The fragmentarily illustrated dishwasher of FIG. 1 may be, for example, of the type disclosed in Warhus U.S. Patent No. 3,064,664, which issued November 20, 1962, for Dishwashing Machine. As noted therein, the water circulation system includes the motor-driven pump 6 and valve-provided drainage system 7. A suitable combination latching device and switch may be as shown in Jellies U.S. Patent 3,005,065, granted October 17, 1961, for Domestic Appliances. Each of these patents is assigned to the assignee of this application.

The dishwasher door comprises an inner door panel 8 and an outer door panel 10 (FIG. 2) suitably secured to each other to form a hollow door structure. The relatively deep upper portion of said hollow structure may accommodate a conventional time cycle device 11 (FIG. 1).

The door structure is provided with a trim and vapor condensation assembly 12 which, among other things, includes an easily grasped handle by means of which the door may be drawn to open position or returned to closed position. As best shown in FIG. 5, the trim structure is composite, including a trim panel 14 having the rearwardly directed base flange 15 and the angularly upwardly and rearwardly directed top flange 16. An end cap 17 completes each end of the upper trim panel; said caps are configured to accommodate the ends of the panel and are provided with tabs 20 to which door panel elements may be attached.

As shown in FIG. 5, the upper flange 16 of the trim plate has a cut-out 21 for the accommodation of the condensing system later described, a cut-out 22 for the previously described latch and switch combination, and an opening 23 to accommodate the control dial (not shown) of the time cycle mechanism.

The trim structure further includes a trim handle 24 of channel formation. That is, the trim handle has a rear flange 25, a front flange 26, and a top wall 27. As best shown in FIG. 2, there is a substantial space 28 between the lower edge of flange 26 and the flange 16 of the top of the trim panel 14. At any place to the right of the cut-out 22, as viewed in FIG. 5, the user of the appliance can insert his fingers into the space so that they engage the rear of the handle wall 26, and placing his

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thumb against the front of said wall, have a firm grip on the handle to open or close the door.

It is well known that dishwasher manufacturers recommend a water temperature of at least 150° F. for the washing and rinsing operations. Water at this temperature gives out substantial amounts of vapor, particularly when it is considered that the water distribution mechanism of the dishwasher is producing a violent water action within the tub during the washing and rinsing operations. It is also well known that among the advantages of dishwashers is that of permitting the dishes to dry as they remain in the tub following the final rinse. This last consideration requires that the tub be vented to the ambient—which is that of the kitchen in which the dishwasher is installed—so that the moisture evaporating from the articles can escape from the tub. In dishwashers not equipped with vapor condensing systems, water vapor passes freely out into the kitchen, and because the trim panels and their accessories are usually much cooler than the issuing vapors, condensation occurs on these parts. A frequent source of customer complaint is that this condensing moisture drips onto the kitchen floor.

The present invention provides a condenser system which reduces the amount of water vapor entering the room and returns condensate to the dishwasher tub.

The condenser structure comprises a first V-shaped plate 29 and a second V-shaped plate 30, each of corrosion resistant metal such as stainless steel. As best appears in FIG. 1, the plate 29 is nested within plate 30; plate 30 has end walls, such as walls 31, FIG. 2, having cut-out portions which receive the ends of the plate 29. Embosses 32 engage the inner faces of walls 31 to establish plate 29 therebetween. Plate 30 is a comb-like structure in which there are a plurality of "teeth" 33 spaced one from the other a distance substantially greater than the width of the "teeth." It will be observed in FIG. 2 that the front longitudinal edge 34 of plate 31 terminates in a longitudinal hook-like formation 35, said formation interfitting with the bead or rail 36 at the base of the front wall of the handle 24. The respective elements 29 and 30 are inherently resilient in a transverse direction. The assembled members 29 and 30 are slid into position through the adjacent open end of the handle, whereupon the hook portion 35 is snug against the bead 36, and the rear wall portion 37 of member 30 is in firm surface contact with the rear wall 25 of the handle. The V-shaped member 29 is in contact with the end walls 31 of member 30, and is in edge contact with the top wall 27 of the handle 24. In such relationship a heat transfer condition exists between the condenser elements 29 and 30, and the handle 24.

The duct communicating between the dishwasher tub and the door is advantageously an assembly of a molded phenolic sleeve 40 and a flexible duct or boot 41. Sleeve 40 is rigid and is formed with a top marginal wall 42 which provides a slot 43 for the reception of edge portions of the trim panel wall defining the cut-out 21; this arrangement allows for sliding sleeve 40 into place from the rear of the trim panel 14, and securement in position when the panel is assembled with the adjacent door panel. The lower end portion of the sleeve 40 fits snugly within the upwardly opening end portion 44 of the boot 41, said boot being sufficiently elastic to accommodate this interfitting relationship. The end portion 44 of the boot 41 communicates with a lateral passage defined by the lateral body portion 45. Said body portion is provided with a flange 46 defining the boot inlet opening. As best shown in FIG. 2, a compression plate 47 has a neck 48 telescoping into the boot, and a rim 50 overlying the flange 46. The plate 47 is held in position by a saddle 51 fixed to a baffle plate 52 which is substantially larger in area than the inlet opening of the boot, and is arranged to intercept

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and deflect water action within the tub and thus prevent direct entry of water into the boot.

Moist air issuing from the boot 41 and duct 40 comes first into contact with the surfaces of the condenser member 30 and gives up some of its moisture by condensation on the teeth 33 thereof. Upward flow of vapor through the structure 30 impinges on the condenser element 29 and is divided by the apex thereof, so that both of the external surfaces of said element 29 are operable as condenser areas.

The handle 24 has a large heat capacity and substantial area exposed to the relatively cooler air of the kitchen. Heat flow to this handle from the elements 29 and 30, maintains these elements at condensing temperature. A further advantage deriving from the V-shaped condenser element 29 is that it will deflect some of the moist air forwardly against the adjacent wall 26 of the handle, whereupon this wall area also forms a prime condensing surface. Water condensing on this wall area will be intercepted by the hook portion 35 of the condenser element 30, and flow down along the teeth 33 to drip from the apex 33a thereof. As appears in FIG. 2, the apexes of the condenser elements 29 and 30 are within the area of the open top of duct 40, whereupon moisture condensing out on the surfaces of the elements 29 and 30 will drip into the duct 40 and flow by gravity into the boot 41 for return to the tub.

In the usual operation of a dishwasher, the door remains closed for a substantial time after the completion of the entire washing and drying cycle. Because of this, any water remaining on condenser elements and on the interior surfaces of the ducts 40 and 41 will be evaporated before the dishwasher door is opened for the removal of the washed and dried dishes. There are times, however, when the dishwasher door is opened during the dishwashing or rinsing cycle, or immediately after the final rinse. At that time there may be residual water on the interior walls of the condensing and ducting system, and such water would be relatively free to drip through the condensing system onto the floor. To circumvent this, I provide a baffle 53 which extends across the portion 44 of the boot 41, immediately beneath the sleeve 40. In such an open door situation, which can be visualized by rotating FIG. 2 counterclockwise through 90°, the front wall of the boot portion 44 slopes downwardly to the left, and the baffle 53 provides a dam having a height sufficient to intercept a substantial amount of condensation. There may also be drops of condensate on the condenser member 29 and the inner surfaces of the condenser teeth 33. In substantial measure, this condensate will gather within the pocket defined by the inner surface of the front wall 26 of handle 24, said wall being arcuate so as to present a concave shallow basin with the door in its open position.

While there has been described what is at present thought to be a preferred embodiment of the invention, it will be understood that modifications may be made therein and it is intended to cover in the appended claims all such modifications which fall within the true spirit and scope of the invention.

What is claimed is:

1. In a dishwasher having a tub and a closure door therefor; the combination comprising a vapor condenser secured to said door at the upper portion thereof and an air and vapor conduit for conducting moisture-laden air from said tub to said condenser, said conduit extending downwardly and rearwardly from said condenser; said condenser including an elongated V-shaped comb of good heat conduction material, the base of said comb being disposed wholly within the outlet end of said conduit; and a V-shaped baffle structure of good heat conduction material within said comb in the path of air issuing from said conduit, the base of said baffle structure being above the base of said comb, said door having an opening to ambient formed therein in communication with said

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condenser thereby to permit the escape of air after it has passed into said condenser.

2. In a dishwasher having a tub and a closure door therefor; the combination comprising a vapor condenser at the upper portion of said door and an air and vapor conduit within said door for conducting moisture-laden air from said tub to said condenser, said conduit extending downwardly and rearwardly from said condenser when the door is in closed position; said condenser including an elongated channel member of good heat transfer material extending laterally of said door, an elongated V-shaped comb of good heat conduction material having elongated wall means in heat transfer relation to said channel member, said comb being disposed within said channel member with the base of said comb within the outlet end of said conduit, and a V-shaped baffle structure of good heat conduction material within said comb in the path of air issuing from said conduit, the base of said baffle structure being above and forwardly of the base of said comb, said door having an opening to ambient formed therein in communication with said condenser thereby to permit the escape of air after it has passed into said condenser.

3. In a dishwasher having a tub and a closure door therefor; the combination comprising a vapor condenser at the upper portion of said door and an air and vapor conduit within said door and communicating with said tub for conducting moisture-laden air from said tub to said condenser, said conduit extending downwardly and rearwardly from said condenser when the door is in closed position; said condenser including an elongated channel member of good heat transfer material extending laterally of said door, said channel member having a substantial area exposed to the ambient air, an elongated V-shaped comb of good heat conduction material in heat transfer relation to said channel member, said comb being disposed within said channel member with the base of said comb wholly within the outlet end of said conduit, and a V-shaped baffle structure of good heat conduction material within said comb in the path of air issuing from said conduit, the base of said baffle structure being coextensive with said comb and above and forwardly of the base of

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said comb, said door having an opening formed therein beneath said channel member in communication with said condenser thereby to permit the escape of air after it has passed into said condenser.

4. In a dishwasher having a tub and a closure door therefor; the combination comprising a vapor condenser at the upper portion of said door and an air and vapor conduit within said door and communicating with said tub for conducting moisture-laden air from said tub to said condenser, said conduit extending downwardly and rearwardly from said condenser when the door is in closed position and downwardly and forwardly toward its discharge end when the door is in open position, said condenser including an elongated metallic channel member extending laterally of said door and having a substantial area exposed to ambient air, an elongated V-shaped comb of good heat conduction material having elongated wall means in heat transfer relation to said channel member, the base of said comb being disposed within said channel member with the base of said comb wholly within the outlet end of said conduit, a V-shaped baffle structure of good heat conduction material within said comb in the path of air issuing from said conduit, the base of said baffle structure being above and forwardly of the base of said comb, and a dam-forming structure extending transversely within said conduit adjacent the discharge end thereof to intercept the flow of residual liquid toward said discharge end when the door is in its open position, said door having an opening formed therein beneath said channel member in communication with said condenser thereby to permit the escape of air after it has passed into said condenser.

References Cited by the Examiner

UNITED STATES PATENTS

2,635,941	4/53	Stoddard	220—10 X
2,871,082	1/59	Karig	312—213
3,075,337	1/63	Andreae	55—446

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